

DURING the summers of 1891 and 1892 Mr. W. P. Hay took the opportunity, while visiting the caves of Southern Indiana, to observe the habits of the blind crayfish, *Cambarus pellucidus*. In some of the caverns, as at Shiloh Cave, the crayfish were extremely abundant. When observed in an undisturbed state, they were found resting quietly in some shallow part of the underground streams on the clay banks. They lay with all their legs extended, and their long antennæ gently waving about to and fro. They were easier caught by the hand suddenly seizing them than with a net. Noise did not seem to affect them. When first taken out of the water they were of a translucent pinkish white colour, with the alimentary track showing through as a blue body, but they soon lost these hues. The variation in the general spininess is very great. As a rule, the farther north the specimens were taken the smoother they were. At Mayfield's Cave, in Monroe County, a variety was found entirely without spines; this is described and figured as a sub-species. (Proc. U.S. Nat. Museum, No. 935, 1893.)

IN Wundt, *Philosophische Studien*, ix. Bd., 1 Heft., Herr Bruno Kämpfe brings together all the values of the integral for the probable error, *i.e.*

$$\phi(\gamma) = \frac{2}{\sqrt{\pi}} \cdot \int_0^{\gamma} e^{-t^2} dt,$$

which gives the whole number of errors, both positive and negative, whose numerical magnitude falls between the given limits. The number of errors between any two given limits will be found by taking the difference between the tabular numbers corresponding to these limits. Since the total number of errors is taken as unity in the table, the required number of errors in any particular case is to be found by multiplying the tabular numbers of the actual number of observations. Thus, to take an example, if there were 1000 observations, and we wish to employ the limits 0.0 and 0.5, then looking in the column giving the values of γ , we find against them the numbers 0.0000 and 0.5205, which when subtracted from one another, and multiplied by 1000 give 520.5 or 520 errors. If the limits had been 1.5 and 2.0, then we should have found the corresponding values 0.9661 and 0.9953, which subtracted give 0.0292, and multiplied by 1000 give 29, *i.e.* 29 errors that lie between these limits out of 1000 observations. This table is published also as a *separatabdruck* by Wilhelm Engelmann, Leipzig, which is in a more useful form for computation. The values of γ can be read directly to three places of decimals.

WE have received a report of the meteorological observations made during 1892 at the Royal Alfred Observatory, Mauritius.

THE new issue of Mr. Edward Stanford's compendium of geography and travel includes a revised and partly rewritten edition of "Australasia." Under this title Dr. A. R. Wallace's excellent description of Australia and New Zealand has been published, and a second volume, embracing Malaysia and the Pacific Archipelagoes, by Dr. F. H. H. Guillemard, is in preparation.

MM. J. B. BAILLIÈRE ET FILS have added to their library of contemporary science a volume entitled "Pêches et Chasses Zoologiques," by the Marquis of Folin. The book is well illustrated, and, though much of the matter it contains is only of local interest, a large portion will be read with profit by students of natural history.

It is very doubtful whether any useful purpose is served by the issue, from Mr. Edward Stanford's, of the series of maps edited by Captain A. Staggemeier, of Copenhagen. The maps show very little except the configuration of the land surfaces, the editor's idea being that they will be of service to physical geographers for placing observed facts of natural history,

meteorology, &c., in their proper geographical position. There are five maps in the portfolio before us, two showing the Polar regions down to 30°, and three the zone between 45° of North and South latitude, on Mercator's projection; hence the zones between latitudes 30° and 45° are represented on both projections. It is intended to issue other maps on a larger scale, the whole series to comprise twenty-five plates, which will be published in six parts.

IT is encouraging to learn, from the forty-first annual report of the working of the Manchester Public Free Libraries, that during the year 1892-93, 77,878 volumes dealing with science and art were issued from the reference library, and 67,456 were referred to in the reading-room. The total number of books issued to borrowers by the nine branch libraries was 872,655, of which 45,526 are classified under science and art. Of the 100,123 volumes consulted in the reading-rooms of the branch libraries, 7869 were on science and art subjects. The record is a good one; but if the committee were to classify science separately from art, we should be better able to estimate from the figures the growth of interest in natural knowledge.

DR. ARTHUR GAMGEE has just completed the second volume of his text-book on the Physiological Chemistry of the Animal Body, upon which he has been engaged for some years. Like the first volume, it constitutes an independent and complete treatise, dealing with the physiological chemistry of the digestive processes. It has been the author's aim to give the reader a very full and, so far as possible, independent account of the state of knowledge on the subjects discussed. Messrs. Macmillan and Co. will publish the volume immediately.

MESSRS. MACMILLAN AND CO. are also about to publish a revised and enlarged edition of "Elementary Lessons in Steam Machinery and the Marine Steam Engine," by Messrs. Langmaid and Gaisford, Instructors on H.M.S. *Britannia*. It will be followed by other works constituting a Britannia Science Series. Among those already in hand may be mentioned "Physics for School Use," by Mr. F. R. Barrett, Mr. A. E. Gibson, Rev. J. C. P. Aldous, and others; a "Physics Note-Book," by Messrs. Gibson and Aldous; "Trigonometry for Practical Men," by Mr. W. W. Lane; and "Geometrical Drawing, Perspective, and Mechanical Drawing," by Mr. J. H. Spanton.

THE additions to the Zoological Society's Gardens during the past week include a Mozambique Monkey (*Cercopithecus pygerythrus*, ♂) a Sykes's Monkey (*Cercopithecus albicularis*, ♂) a Bell's Cinixys (*Cinixys belliana*) from East Africa, presented by Mr. T. E. C. Remington; a Red Tiger Cat (*Felis chrysothrix*) from the Gold Coast, West Africa, presented by Mr. William Adams; a Common Otter (*Lutra vulgaris*) from Yorkshire, presented by Mr. C. B. C. de Wit; a Herring Gull (*Larus argentatus*) British, presented by Mr. J. G. Goodchild; a Northern Mocking Bird (*Mimus polyglottus*) from North America, presented by Miss Dorothy Williams; a Viperine Snake (*Tropidonotus viperinus*) European, presented by Miss Ffennell; five Barbary Partridges (*Caccabis petrosa*) from North Africa, deposited.

OUR ASTRONOMICAL COLUMN.

THE VARIATION OF LATITUDE.—In the *Astronomical Journal*, No. 19 (November 14), Prof. S. C. Chandler gives the eighth of the important series of articles that he has been contributing on the variation of latitude. The special part of the subject which is referred to deals with the direction of the rotation of the pole and is accompanied by an explicit demonstration which includes all the data bearing upon it. Owing to the insufficient extent of series of observations in widely different longitudes to furnish independent values of the constants

for both terms of the variation, Prof. Chandler has thought well to combine short series made in nearly the same longitudes, and so deduced fourteen determinations of the numerical equations for the latitude variation. Reducing the values so obtained to a common epoch, he found that the values of the observed Julian date when the latitude would be a minimum, or when the pole of figure would pass the meridian of the respective stations by virtue of the fourteen months revolution alone, and of the sun's longitude on the observed date when the same phase would occur by virtue of the annual term alone, both decreased from Pulkowa towards Madison showing that the direction of the rotations in both the elements was from west to east. In the latter part of the article Prof. Chandler refers not only to our knowledge of the general law of latitude variation, but to the accuracy of the necessary constants which afford us a means of predicting the immediate future course. The minimum of the curve of April, 1893, will be followed by an interval of nearly two years, and will be marked by very slight fluctuations, so that from the maximum of October, 1893, to that of August, 1895, or from minimum April, 1893, to that near the beginning of 1895, "there will apparently be but a single decidedly marked period of, say 20-22 months," the total range amounting to $0''.10$ as against $0''.56$ which prevailed in 1889 and 1892. In May, 1896, the same dimensions as in 1889 will be again attained, and the variation from that time forward to 1898 it will be in full play with the range of $0''.5$ or $0''.6$, a period of nearly 390 days which prevailed between 1889 and 1892. In § 2 of the article Prof. Chandler adds a few words as to the reality of these movements of the earth's axis as against the motions being "merely misinterpretations of the observed phenomena" or an illusory effect of instrumental error due to the influence of temperature. Those of our readers who are still sceptical on the subject will learn that the observed law of latitude variation includes two terms, one with a period of fourteen months, and another with twelve months, making the phases come in very different relations to conditions of temperature dependent on season, an argument greatly against that brought forward by temperature-variation believers.

METEOR SHOWER FOR DECEMBER.—No news is yet to hand with regard to the Biela meteors, but we hope soon to receive accounts of the display which will give us some idea of the quantity and also of the date of reaching their maximum. The following meteor radiant-points are given by Mr. Denning for the ensuing month, that for the 10th lying approximately close to ρ Gemini in a prolongation of β and ρ Gemini, and being defined as a "most brilliant shower."

Date.		Radiant. α	δ	Meteors.
Dec. 8	...	145°	$+ 7'$	Swift; streaks
8	...	208	$+ 71$	Rather swift
10	...	108	+ 33	Swift; short
24	...	218	$+ 36$	Swift; streaks
25	...	98	$+ 31$	Very slow

REFRACTION TABLES.—We have received a small pamphlet extracted from the *Mittheilungen aus der Deutschen Schutzgebieten*, Bd. vi., Heft 4, containing refraction tables computed by Dr. L. Ambronn, of the Göttingen observatory. These tables are not intended for such accurate values as are required in observatories with fixed instruments, but are intended to be used by those, who having made astronomical observations, wish to compute them on the spot, using approximate formulæ. Travellers, especially, will find these tables very useful for wide ranges, both as regards temperature and barometer arguments. The tables are based on Bessel's refraction-table formula, and by slightly combining the first two terms, which is no other than the mean refraction, and eliminating the term $\log T$ by reducing the height of the barometer to 0°C becomes, employing the usual notation:

$$\log \text{refraction} = \log a \tan z + A \log B_0 + \lambda \log \gamma$$

or

$$\text{refraction} = a \tan z \times B_0^A \times \gamma^\lambda \dots (1)$$

To make the correction for the mean refraction additive, the expression can be put in the form:

$$\text{refraction} = [a \tan z + a \tan z (\gamma^\lambda - 1)] B_0^A$$

Table II. gives the expression for the second term in the brackets using the mean refraction ($a \tan z$) and the air temperature (γ) as arguments. For the barometer correction, if

$a \tan z$ represent the mean refraction corrected for temperature then in equation (1) we may omit γ and write

$$\text{refraction} = (a \tan z) \times B_0^A$$

$$\text{or, refraction} = (a \tan z) \times (a \tan z) [B_0^A - 1]$$

The second term is taken direct from Table III. using the mean refraction (corrected for temperature) and the height of the barometer as arguments.

To obtain the true refraction then, one simply (1) finds the mean refraction for the given zenith distance; (2) adds then the correction for temperature, and with this corrected mean refraction as argument; (3) adds the corresponding correction for the height of the barometer. Accuracy up to less than half a second of arc can be obtained.

GEOGRAPHICAL NOTES.

THE friends of the late Emin Pasha, at the suggestion of Dr. Schweinfurth, have resolved to collect subscriptions for a memorial to commemorate his long labours in Africa as a naturalist, traveller, and administrator. There must be many in this country anxious to have a share in such a tribute, and we shall shortly be able to intimate where subscriptions should be sent. The present proposal is to erect a monument in the Silesian town of Neisse.

BY the death of Mr. A. L. Bruce, at Edinburgh last week, the cause of geography and civilisation in Africa has lost a wealthy and judicious promoter. Mr. Bruce, who married as his second wife a daughter of Dr. Livingstone, was a director and one of the founders of the Imperial British East Africa Company. He was a devoted friend and warm supporter of Mr. H. M. Stanley, and took a leading position in organising and supporting the Emin Relief Expedition. Mr. Bruce was the originator of the Royal Scottish Geographical Society, of which he acted as treasurer, and in the prosperity of which he took the keenest interest to the last.

GUILIO GRABLOVITZ has published as a pamphlet a paper on tidal phenomena in the Mediterranean, read at the Italian Geographical Congress, and entitled "Sulla Osservazioni Mareografiche in Italia e specialmente su quelle fatte ad Ischia." The work done with recording mareographs is of considerable importance and several diagrams are given showing the tidal range and its fluctuations. The mean rise of the water was 11 centimetres at San Remo, 24 at Genoa, 12 in the North of Sardinia, from 15 to 22 along the west coast of Italy as far as Ischia, 30 in the Lipari Islands, but only from 2 to 13 round Sicily. In the Adriatic the range increased from 9 centimetres at Brindisi to 48 at Venice, which was the only station showing a range greater than one foot. The curves are recorded on a large scale, the ripples of the calm water in which the mareograph worked bearing a comparatively large ratio to the total tidal amplitude.

MONT ISERAN, in the eastern Alps, is, or rather was, one of the most remarkable mountains on the map of Europe, where it flourished long, although without any physical representative on the mountain-range itself. M. Henri Ferrand, in an entertaining little brochure relates its story, showing how it had come to be an accepted belief amongst cartographers that the river Isère had its source in a Mont Iseran. The mountain was fixed in latitude, longitude, and altitude by an Italian surveyor in 1809; but in the fifties, when Alpine climbing became fashionable, the discovery was made by climbers that no one in the neighbourhood could point out Mont Iseran. There was a col of that name, but no peak. An exhaustive French survey conclusively proved that the summit so long honoured on all maps had no real existence, and M. Ferrand tells the whole amusing history remarkably well as a lesson of the value of mountain-climbing, even to scientific topography.

THE telegraphic cable opened last month from Zanzibar to Mauritius and Seychelles is an important link in the cable network which is gradually encompassing the globe.

THE ANNIVERSARY MEETING OF THE ROYAL SOCIETY.

THE anniversary meeting of the Royal Society was held in the apartments of the Society at Burlington House, on St. Andrew's Day, November 30. The auditors of the